



Canadian Psychiatric Association  
Association des psychiatres du Canada

## Electroconvulsive Therapy: Core Review of Current Practice

- Anesthesia
- Medications
- Adverse Effects
- Maintenance ECT

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# Learning Objectives

By the end of this session, participants will be able to:

1. Describe indications and assess risk when selecting ECT for patients
2. Be aware of how ECT technique can affect clinical outcome
3. Consider the role of various anaesthetics and medications in ECT outcome

# Agenda

- 2.45-2.50pm: Welcome/Opening Remarks: Dr. Kiran Rabheru
- 2.50-3.20pm: Indications, Pre-ECT Work-up,  
& Neurobiological Mechanisms Dr. Peter Chan
- 3.20-3.50pm: ECT Technique & Equipment Dr. Caroline Gosselin
- 3.50-4.20pm: Anesthesia & ECT, Medication  
Review, Adverse Effects,  
Maintenance ECT Dr. Kiran Rabheru
- 4.20-4.40pm: Questions/Discussion with the panel

# Break-Out Groups

- 4.45-5:15 pm                      Groups 1 & 2
- 5.15-5.45pm                      Groups 1 & 2 Switch
  
- Group 1                      Drs. Chan and Rabheru
  - Electrode Placement
  - Skin preparation
  - Managing High Seizure Thresholds
  
- Group 2                      Dr. Gosselin
  - Conducting an ECT course using EEG Interpretation



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# Electroconvulsive Therapy: Core Review of Current Practice

## Faculty

Dr. Kiran Rabheru, Professor, U of O

Dr. Peter Chan, Professor, UBC

Dr. Caroline Gosselin, Professor, UBC

# Medically “Fit for ECT”?

- ACC-AHA 2007: “Low risk procedure”
  - Equal to non cardiac surgery
- Short duration, no fluid shifts, low complication rate
- If no active heart disease & patient is stable: “Fit for ECT”.

Clinical effectiveness is not necessarily dependent  
on duration of motor or EEG but mainly  
Quality of Seizure.

# Potential Complications: Anesthesia & ECT

## Known to cause or associated with:

- myocardial ischemia
- Infarction
- Ventricular tachycardia
- cardiac rupture
- transient LV systolic & diastolic function decrease
- TIAs
- Cortical blindness
- Fractures
- Dislocations
- Muscle aches
- Nausea, Headache
- Emergent agitation
- Sudden death.

# Special Precautions:

## Increased Autonomic Sensitivity

- Hyperthyroidism – when clinically evident
- Congestive Heart Failure-decompensated
- Increased ICP
- Fragile aneurysm
- Narrow angled or closed angled glaucoma
- Retinal detachment
- Pheochromocytoma
- Recent MI / Stroke
- Severe valvular disease
- Significant arrhythmia
- Uncontrolled / Unstable angina or hypertension



# Special Precautions:

## Increased Anesthesia Sensitivity

- Genetic / Acquired pseudocholinesterase deficiency
- Myasthenia gravis
- Neuroleptic malignant syndrome
- Pregnancy
- Dementia

# Response to ECT: Physiologic

- Acute increase Cerebral Blood Flow (CBF) by 133% & Intracranial Pressure (ICP).
- PSNS 10-15 secs, SNS up to 5 mins:
  - 20% HR increase and 30-40% BP increase, 2-5 x increase RPP, Bilateral>Unilateral, older age >younger
- Low levels of CO<sub>2</sub> increases RPP, correlates with Sz duration

# Response to ECT: Cardiovascular

- Initial Tonic Phase: Parasympathetic response
- **Subconvulsive seizures: = HIGHER RISK!**
  - Bradycardia: + / - hypotension
  - Asystole
  - Atrial arrhythmias
  - PACs & PVCs
  - AV Blocks

# Response to ECT: Cardiovascular

- Sympathetic Phase with seizure
- **Dramatic increase HR (52%) & BP (25%)**
- Sympathetic tone → Tachycardia & hypertension.
- Increase in **Rate Pressure Product (RPP)**
- Transient decrease in ejection fraction
- In most patients minor & transient:
- Resolves in 20 min but needs attention

# Medical Problems to watch for:

- **Cardiovascular:**
  - Age: >80: 36% vs >65: 12%
  - Pre-existing disease: IHD, CHF, Arrhythmias, valvular disease
- **Falls:**
  - Age: >65: 14% vs >85: 36%
  - Increased with # ECTs & Parkinson's Disease
- **Pulmonary:** COPD, Asthma, Pneumonia
- **Airway**, anticipate intubation problems
- **Neurologic:**
  - Raised intracranial pressure (ICP)
  - Delirium
  - Memory loss: age, electrode placement, frequency
- **Nuisance effects:** Headache, nausea, fatigue, etc.
- **Myalgias:** succinylcholine: Enzyme deficiency

# Anesthesia in ECT: Goals

1. Rapid loss of consciousness
2. Effective attenuation of the hyperdynamic response to the electrical stimulus
3. Avoidance of gross movements
4. Minimal interference with seizure activity
5. Prompt recovery of spontaneous ventilation and consciousness

# Effect of Drugs on ECT-Induced Seizure Activity

Drug	Increase	No Change	Decrease
Anesthetic	Etomidate Remifentil Alfentanil	Methohexital	Thiopental Propofol Lorazepam Midazolam Ketamine Fentanyl
Cardiovascular	Aminophylline Caffeine	Esmolol Labetalol Clonidine Nifedipine Nitroglycerine Nitroprusside	Labetalol Esmolol Lidocaine Diltiazem

# Anesthesia: Muscle Relaxants

- **Succinylcholine: (Sux)** 0.75 to 1.5 mg/kg
  - Plasma lactate can cause post ECT agitation; increase dose of Sux helps.
  - Even small doses can give side effects: eg. In bradyarrhythmias, myalgia, hyperthermia, hyperkalemia, Malignant hyperthermia, NMS, catatonic schizophrenia, organophosphate poisoning.
- **Mivacurium (MC)** 0.08-2 mg/kg can be used instead. Full intubating dose may be needed & anticholinesterase inhibitors may be needed to reverse residual paralysis. Hypotension & histamine release may occur.



# Anesthesia: Secretions & Bradycardia

- **Atropine** (0.15 µg/kg or 0.3-0.6 mg IV)
  - Results in higher RPP and CNS / peripheral anticholinergic side effects.
- **Glycopyrrolate** (0.1-0.3 mg IV)
  - Anticholinergic that lacks CNS activity.
  - Reduce oral secretion and bradycardia without post ECT tachycardia:
  - Drug of choice for ECT.

# Anesthesia: Hypertension

- **Esmolol** ( $EL-\beta_1$ ) (1-1.3 mg/kg)
- **Labetalol** ( $LL$ -mixed  $\alpha\beta$ ) (0.1-0.2mg/kg)
  - Attenuates  $Sys_{BP}$   $LL > EL$
- **Nifedipine**: 10 mg SL given 20 min before ECT to reduce MAP.
- **Nicardipine** 1.25-2.5 mg IV +  $LL$  10 mg IV  $\rightarrow$  best IV combination. 20% lower MAP pre-ECT & post vs.  $LL$  alone; no change Sz.

# Anesthesia: Hypertension (Cont.)

- **Clonidine**:  $\alpha_2$  adrenergic agonist / antagonist 0.05 to 0.3 mg po 60-90 mins pre-ECT dose-related reduction in BP before ECT but no change in Sz.
- **NTG 0.4 mg as a sublingual spray**: consider for ischemic patients
- **NTG 2% ointment** was applied 45 min before ECT attenuates the increase in HR and MAP after ECT
- **NTG: Nitroglycerin 3  $\mu$ g/kg IV** given 2 min before ECT lowers BP > esmolol 2 mg/kg IV
  - **NTG**: partially inhibits the increase in CBF velocity

# Anesthesia: Hypertension (Cont.)

- **Nitroprusside, intravenously**, peripheral-acting vasodilator, used in patients with intracranial aneurysms, dissecting aortic aneurysm, and critical aortic stenosis requiring ECT. With  $\beta$ -blocker, attenuates HR, BP & CBF increase & no change in Sz.
- **Combination of a  $\beta$ -blocker and IV nitroprusside** prevents tachycardia and hypertension → decreases flow velocity in the middle cerebral artery after ECT

# Medications requiring special consideration before electroconvulsive therapy

MEDICATION	POSSIBLE UNDESIRABLE EFFECT
Lidocaine	Seizure inhibition
Diabetic agents	Hypoglycemia
Theophylline	Prolonged seizures, status epilepticus
Antidepressants, mood stabilizers	
Carbamazepine (Carbatrol, Tegretol)	Seizure inhibition (major effect)
Gabapentin (Neurontin)	Seizure inhibition (major effect)
Lamotrigine (Lamictal)	Seizure inhibition (minor effect)
Lithium	Delirium, prolonged seizures
Monoamine oxidase inhibitors	Hypertensive crisis
Tricyclic antidepressants	Cardiotoxicity
Topiramate (Topamax)	Seizure inhibition (minor effect)
Valproic acid (Depakene)	Seizure inhibition (major effect)
Benzodiazepines	Seizure inhibition, reduced efficacy, cognitive effects
Anticholinesterases	Prolonged anesthesia effect
Herbal supplements	
Ginkgo biloba	Increased intracranial pressure, cerebral hemorrhage
Ginseng	Parasympathetically mediated bradycardia
St. John's wort	Prolonged anesthesia effect, cardiovascular collapse

# ECT , Anesthesia: Drug Interactions

- **Antidepressants** and ECT combine safely and beneficially.
- **MAOIs**: CAUTION! especially irreversible.
- **Anticonvulsants and mood stabilizers, lithium**: risk of delirium and/or organic syndromes developing.
  - Concerns with valproate , carbamazepine, lamotrigine, gabapentin and topiramate may inhibit seizure activity.
  - Carbamazepine may prolong the action of succinylcholine.

# ECT , Anesthesia: Drug Interactions

- **Antipsychotics** and ECT is well tolerated, and may in fact be beneficial.
- **Anxiolytics, benzodiazepines** are anticonvulsants : may lower therapeutic efficacy of ECT.
- **CNS stimulants** prolong seizures; arrhythmias & elevate BP.
- **Calcium channel blockers**: cautiously to avoid cardiac depression.

# Details: ECT

- NPO overnight for solid food
- Clear liquids OK for oral meds up to 1 h pre-ECT.
- Patients with cardiac disease should take all chronic antihypertensive medications before ECT.
- Headache Prophylaxis: Aspirin (650 mg orally) or acetaminophen (650 mg orally).
- In younger patients at risk for severe ECT-induced myalgias, headaches, or both, ketorolac 30 mg IV;
- Intranasal administration of the 5-hydroxytryptamine-1 agonist sumatriptan may be beneficial in patients developing post-ECT headaches despite prophylaxis with ketorolac.



# Details of ECT

- **Face mask** with a standard circle or a simple bag-valve-mask system
- **Resuscitative equipment must be available**, as must a laryngoscope, tracheal tube, and laryngeal mask airway for management of an airway emergency.
- **Tracheal intubation is not recommended** except in very specific situations (e.g., late pregnancy or emergency treatments with full-stomach precautions).

# Details of ECT

- EEG and EMG monitoring, or a tourniquet technique to isolate the circulation to an extremity before the muscle relaxant is administered.
- Bite block: teeth and to minimize the risk of lacerating the tongue.
- Nausea and vomiting, as well as dizziness, monitored for 15–30 min after ECT.
- For confusion, agitation: Emergence agitation after ECT is usually treated by administering a small dose of **midazolam (0.5–1 mg IV)**

# *Concurrent Psychiatric Drugs*

- **SSRIs & Venlafaxine** vs TCAs: seizure durations similar. OK to give.
- Venlafaxine: prolonged bradycardia (N=1).
- **Moclobemide**: (300 mg/d) no important side effects (N=13)
- **Lithium** can delay recovery from muscle relaxants
- **Anticonvulsants (AC)**: & ECT can be co-administered safely and effectively.
- **Lamotrigine (LTG)** has little or no influence on the induction of seizures and on seizure duration.

# C/MECT: Efficacy Considerations

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- Reduction of hospitalization
- Safer, less restrictive, less disruptive vs. being on ineffective medication
- Maintains higher level of function
- C-ECT good predictor of wellness (weaker with meds) after acute ECT??
- Likely reduces suicide rate – Yes!
- Psychotic & Delusional symptoms remit

# C/MECT: Efficacy considerations

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- Does not prevent breakthrough symptoms in all patients
- Frequency of treatment may vary.
- Common residual symptoms: depressive mood & poor social functioning
- May induce switch of mood in “atypical bipolars”

# C/MECT: Adherence & Acceptability

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- Very significant factor for outcome
- Family support vital
- Relapse is common if treatment(s) missed
- Up to 80% after 10 weeks
- Overall adherence & acceptability is high

# C/MECT: Summary

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- MECT: Vital tool for psychiatrists
- Effective for prophylaxis in medication-resistant, refractory, or intolerant patients.
- Reduces relapse, recurrence, and rehospitalization in recurrent mood, thought, or motor-function disorders. Elderly depressed respond particularly well.
- Efficacious, well-tolerated, relatively safe, & cost-effective when appropriately used for maintenance therapy.